



# *Advanced Air Mobility (AAM): An Overview and Brief History*

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## *Presentation Outline:*

*I. Overview of AAM*

*II. Brief History of AAM*

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# *Overview of AAM*



# Advanced Air Mobility (AAM) Mission



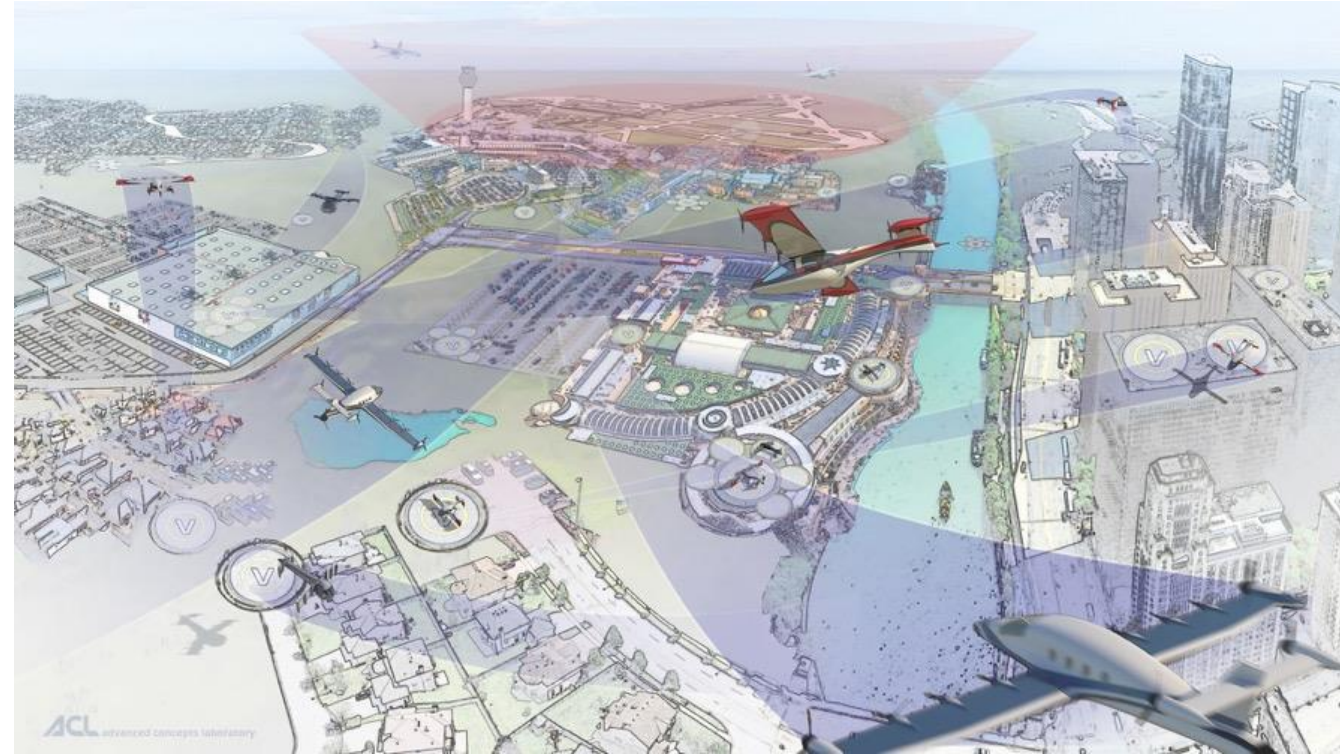
*Safe, sustainable, affordable, and accessible aviation for transformational local and intraregional missions*





# Advanced Air Mobility (AAM): Bringing Aviation into Daily Life

- Three primary mission categories:
  - Urban Air Mobility (UAM)
    - “Local” missions up to ~75 miles around metropolitan areas
    - Largely novel “vertiport” infrastructure
    - eVTOL, potentially eSTOL or eCTOL aircraft
    - 1 to ~6 passengers or equivalent cargo
  - Small Unmanned Aircraft Systems (sUAS)
    - Local missions for aerial work or small cargo delivery (e.g., food, small packages)
    - Range of required takeoff/landing infrastructure from none to specialized
    - Typically VTOL-capable aircraft
  - Regional Air Mobility (RAM)
    - “Intraregional” missions up to ~500 miles
    - Primarily utilize existing (smaller) airports
    - eCTOL and eSTOL aircraft
    - Up to 19 passengers or equivalent cargo



- AAM is generally enabled by electrification & automation
- Many potential uses, including
  - Passenger transport
  - Cargo/package delivery
  - Emergency services/public good (e.g., air ambulance, EMT transport, etc.)
  - Aerial work (e.g., infrastructure inspection, photography, tourism, etc.)



# Addressing AAM Challenges



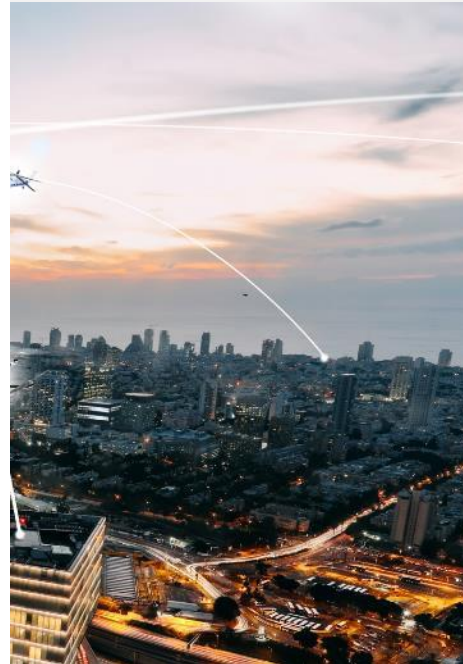
## Vehicle Development and Operations



## Airspace Design and Operations



## Community Integration



**NASA and key partners are collectively taking on the most difficult mission challenges to enable industry to flourish by 2030**

- **Research and Development Portfolio**
- **AAM National Campaign Series**
- **Robust Ecosystem Partnerships**

NASA to deliver long term technical solutions and architecture requirements for the industry and regulatory communities





# AAM Ecosystem Working Groups

Align on a common vision  
for AAM

Learn about NASA's research and  
planned transition paths

Adopt a strategy for engaging the  
public on AAM



Collectively identify and  
investigate key hurdles and  
associated needs

Develop AAM system and  
architecture requirements

Support regulatory and  
standards development

*Form a connected stakeholder community*

See <https://nari.arc.nasa.gov/aam-portal/> for more information

Accelerate the development of safe and scalable AAM flight operations  
by bringing together the broad and diverse ecosystem





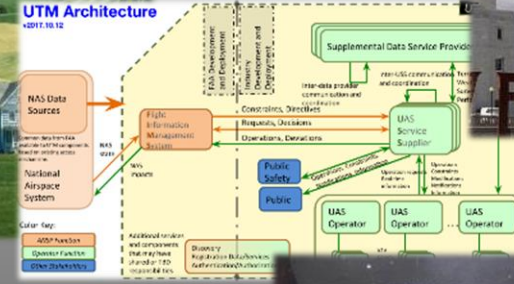
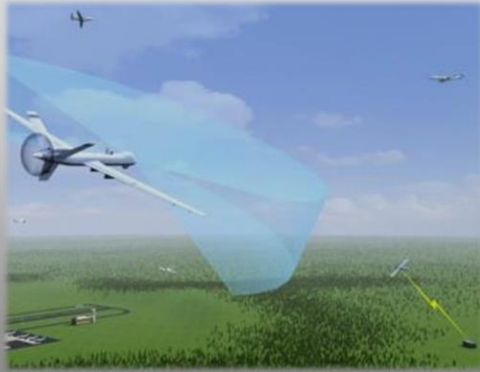
# *Brief History of AAM*





# AAM is Convergence of the General Aviation and UAS Communities

UAS



2000

2010

2015

2020

GA



AAM can be traced back to the early 2000s.  
Interest has grown exponentially since the late 2010s.





*Discussion*





**BACK-UP**





# What is an eVTOL aircraft?

- eVTOL = electric vertical takeoff and landing
  - Mix of all-electric, hybrid-electric, fuel cell power systems
- Many configurations – no clear “dominant configuration”
  - Multirotor, (multi) tiltwing, (multi) tiltrotor, fan-in-wing, separate lift + cruise, compound helicopter, tiltduct, blown flap/tiltduct, advanced rotorcraft, etc.
- Common characteristics:
  - 1 to 6 person payload
  - Shorter hover duration than typical rotorcraft
  - Often considerably shorter ranges than conventional aircraft



All images are NASA reference aircraft: <https://sacd.larc.nasa.gov/asab/asab-projects-2/uam-refs/>



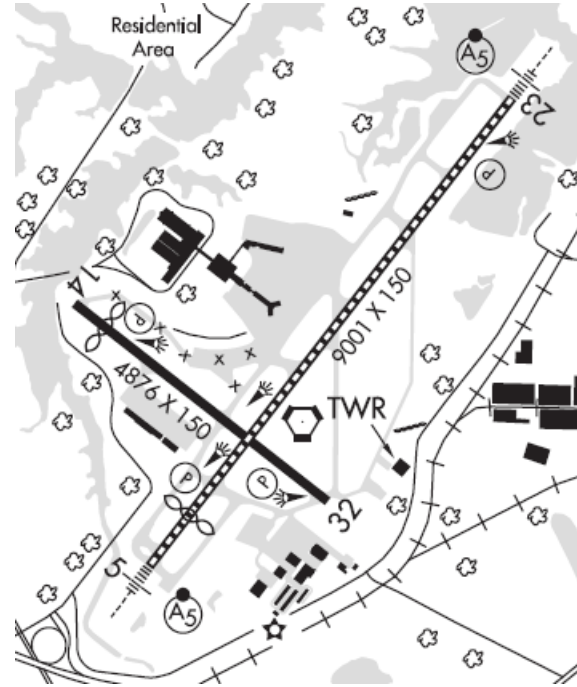


# *Airport/Vertiport Integration Considerations*

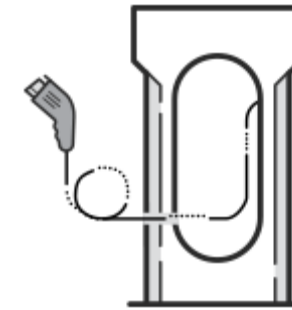


# Airport Considerations: Electrification

- Installation of chargers
  - Accessible locations for all operations
  - Consider use also for ground vehicles
  - Ongoing charging standardization discussions
  - How to monetize charging?
- Connectivity to electrical grid
  - Potentially large additional power requirements (multi-MW)
  - Long lead times
- Microgrids/renewables
  - Potentially large available land area
  - Sustainable energy supply for aviation and/or to improve local electricity grid



Roanoke Airport diagram from  
FAA's Chart Supplement



Solar arrays outside of runway object free area  
at Chattanooga Airport (CHA)

Imagery from NationalMap.gov

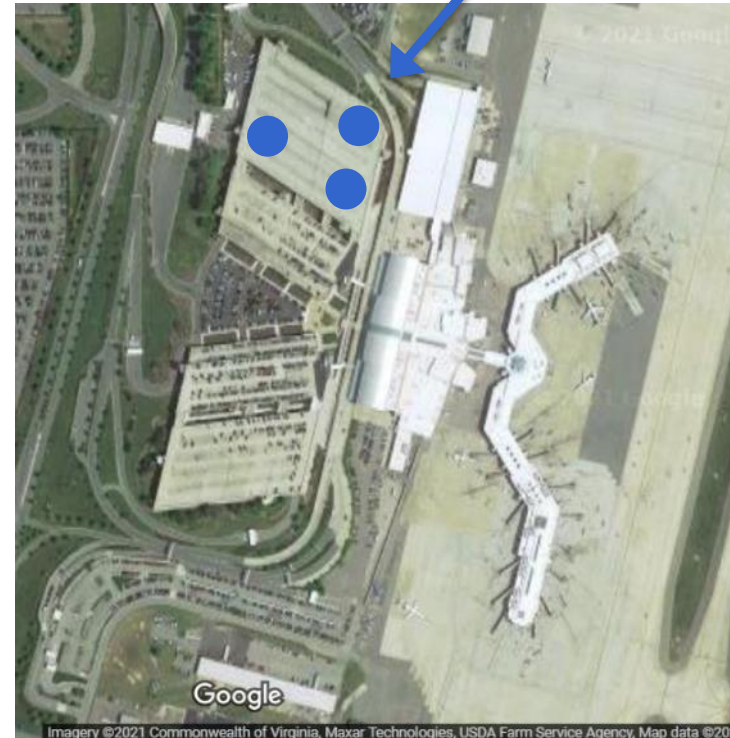
Note: ongoing NASA-funded research by Georgia Tech assessing potential energy demand for RAM and potential for on-airport renewables to generate needed electricity



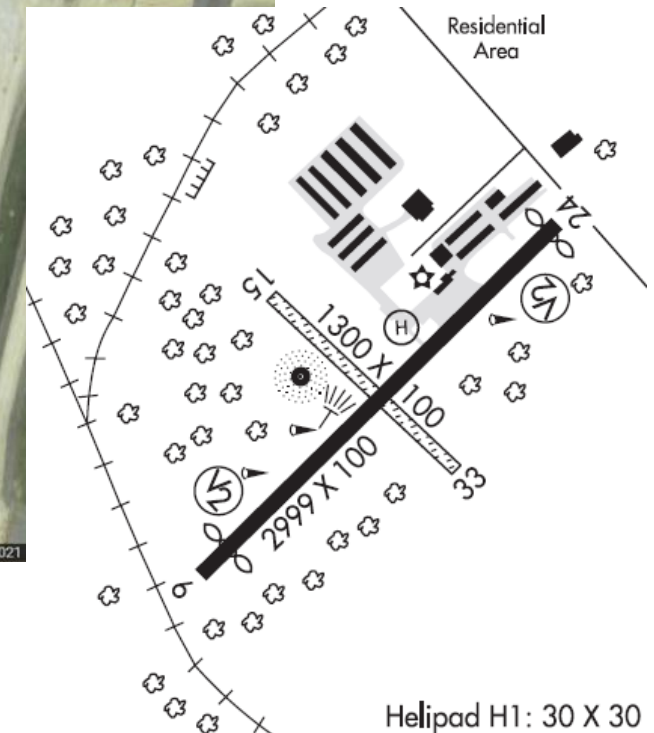
# Other Airport Considerations

- Improved multi-modal connectivity for FBOs
  - AAM operations *not* likely to use existing Part 121 passenger terminals
  - Mode change times need to be kept small
  - RAM and some UAM ops likely to utilize existing airport runways
  - FBOs may partner with indirect/direct air carriers
- Consider inclusion of new vertipads at airports
  - Ideally direct passenger access to existing passenger terminals (at larger airports)
  - Enable deconflicted approach/departure paths with existing air traffic

Notional vertipad locations on a parking garage at RIC



Imagery from Google Maps  
©2021 Commonwealth of Virginia, Maxar Technologies, USDA Farm Service Agency



Airport diagram showing existing helipad at EZF (Shannon Airport, Fredericksburg) from the FAA's Chart Supplement



# Vertiports

- Many potential locations
  - Greenfield sites
  - Rooftops
  - Parking garages
  - Barges
  - New overpasses / cloverleaves?
  - Etc.
- Many siting considerations
  - Multi-modal connectivity
  - Noise
  - Utilities (electric grid)
  - Proximity of other vertiports/pads
  - Equity
  - Etc.
- Vertiport design guidelines under development

